UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/575,584	04/11/2006	Udo Van Stevendaal	DE030352US1	9566

24737 7590 10/03/2008

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
P.O. BOX 3001
BRIARCLIFF MANOR, NY 10510

EXAMINER	
CORBETT, JOHN M	
ART UNIT	PAPER NUMBER
2882	
MAIL DATE	DELIVERY MODE
10/03/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/575,584	VAN STEVENDAAL ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-10,12,13 and 15* is/are rejected.

7)☒ Claim(s) *6,11 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The specification is objected to because it refers to claim 6 on page 4, lines 6-7 of the amended specification as filed on 12 June 2006, which may create discrepancies and new matter issues if future claim amendments were to be made. Therefore, the examiner suggests removing all references to the claims that are in the specification.

Appropriate correction is required.

2. The amended specification as filed on 12 June 2006 is objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s):

(Page 7, line 19, "source of radiation 59" was claimed, perhaps "source of radiation 49" was meant).

Appropriate correction is required.

Claim Objections

3. Claims 1-15 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s):

(Claim 1, lines 11-17,

"a processor configured to perform at least the following operation:

determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume;

rendering the reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume; and" was claimed, perhaps

"a processor configured to perform at least the following operation:

determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume;

rendering the reconstruction volume; and" was meant).

(Claim 2, line 7, "; wherein the first source trajectory is a circle", was claimed; perhaps "; and wherein the first source trajectory is a circle" was meant).

(Claim 7, lines 14-20,

"a data processor which is adapted to perform at least the following operation:

determining a wave-vector transfer by using the spectrum acquired by using the scatter radiation detector;

determining a reconstruction volume;

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer;

wherein the wave-vector transfer represents curved lines in the reconstruction volume; and" was claimed, perhaps

"a data processor which is adapted to perform at least the following operation:

determining a wave-vector transfer by using the spectrum acquired by using the scatter radiation detector;

determining a reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume; and" was meant).

(Claim 12, lines 5-11, "the method comprising the acts of:

determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume;

rendering the reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume; and"

was claimed, perhaps "the method comprising the acts of:

determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume;

rendering the reconstruction volume; and" was meant).

(Claim 15, lines 8-12,

"determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume;

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer;

wherein the wave-vector transfer represents curved lines in the reconstruction volume; and" was claimed, perhaps

"determining a wave-vector transfer by using the at least partial spectrum;

determining a reconstruction volume, wherein a dimension of the reconstruction volume is determined by the wave-vector transfer, wherein the wave-vector transfer represents curved lines in the reconstruction volume;

rendering the reconstruction volume; and" was meant).

For examination purposes, the claims have been treated as such.

Claims 3-6, 8-11 and 13-14 are objected to by virtue of their dependency.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claim 15 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With regards to claim 15, the claim is directed to a judicial exception; as such, pursuant to the Interim Guidelines on the Patent Eligible Subject Matter (MPEP 2106), the claims must have either physical transformation and/or a useful, concrete and tangible result. The claims fail to include transformation from one physical state to another. Although, the claims appear useful and concrete, there does not appear to be a tangible result claimed. The step of merely rearranging data is not sufficient to constitute a tangible result, since the outcome of the subjecting step has not been used in a disclosed practical application nor made available in such a manner that its usefulness in a disclosed practical application can be realized. As such, the subject matter of the claims is not patent eligible.

An example, which would make the subject matter of the instant claim 15 statutory, would be to include a step of displaying a reconstructed image or outputting a material discrimination.

With regards to claim 15, the claim is drawn to a computer program per se. A computer program per se is a set of abstract instructions. Therefore, a computer program is not a physical

thing (product) nor a process as they are not "acts" being performed. As such, these claims are not directed to one of the statutory categories of the invention (See MPEP 2106.01), but directed to nonstatutory functional descriptive material.

An example that would make the instant claims statutory would be to claim ***a computer readable medium encoded with a computer program*** which, when implemented on the data processor, instructs the data processor to perform the desired method steps. Hence, the claims would be directed to statutory subject matter.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-5, 12-13 and 15 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for x-ray radiation, does not reasonably provide enablement for all types of radiation such as visible and particle radiation. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

With respect to claims 1, 12 and 15, the claims are directed towards at least a partial spectrum, which reads on all types of radiation such as visible and particle radiation. However, the specification does not enable a person of ordinary skill in the art to make the invention with visible or particle radiation. The specification only provides enablement for x-rays (See page 7,

lines 31-32 of the specification as originally filed on 11 April 2006). Therefore, the claims are rejected for enablement issues. Claims 2-5 and 13 are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 7-10 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harding (US 6,470,067) in view of Van Stevendaal et al. ("A reconstruction algorithm for coherent scatter computed tomography based on filtered back-projection", 22 August 2003, Medical Physics, Volume 30, Number 9, Pages 2465-2474).

With respect to claim 1, Harding discloses a data processing device (10) for performing a reconstruction of computed tomography (CT) data (Title and Abstract), the computed tomography data is reconstructed from acquired CT data (Col. 3, lines 46-53), the data processing device comprising:

a detector (16) comprising energy resolving (Col. 4, lines 35-38) detector elements (161) configured to acquire at least a partial spectrum (Col. 1, lines 27-38, Col. 4, lines 17-24 and Col. 4, lines 30-38);

a memory necessarily configured to store at least one of the acquired CT data and the computed tomography data (image processing computer (10) necessarily has memory to store at least the acquired CT data used in the reconstruction process and the computed tomography data reconstructed during image processing), and

a processor (10) configured to perform at least the following operation:

determining a wave-vector transfer by using the at least partial spectrum (Col. 2, lines 20-23 and Col. 4, lines 17-38);

determining a reconstruction volume, a dimension of the reconstruction volume is determined by the wave-vector transfer (Col. 1, lines 24-29, Col. 1, lines 31-37 and Col. 4, lines 17-38 and Figures 1-3, momentum transfer determined for view and fan angle which is then reconstructed into voxels); and

rendering the reconstruction volume (Col. 5, lines 4-10).

Harding fails to disclose the wave-vector transfer represents curved lines in the reconstruction volume.

Harding further fails to explicitly disclose rearranging the acquired CT data such that it corresponds to an acquisition where the x-ray source is displaced along a desired source trajectory in the reconstruction volume.

Van Stevendaal et al. teaches the wave-vector transfer represents curved lines in the reconstruction volume (Abstract, lines 4-6, Page 2468, Col. 2, lines 26-28 and Figures 3 and 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to

improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

Van Stevendaal et al. further teaches rearranging the acquired CT data such that it corresponds to an acquisition along a desired source trajectory in the reconstruction volume (Pages 2469-2470, Section 2. Parallel detector geometry).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

With respect to claim 2, Harding as modified above suggests the device as recited above. Harding further discloses the acquired CT data is acquired during an acquisition a source of radiation is displaced along a first source trajectory (Col. 3, lines 1-32).

Harding fails to explicitly disclose the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; and

the first source trajectory is a circle.

Harding further fails to disclose and the second source trajectory is a helix.

Van Stevendaal et al. teaches the first source trajectory is a circle (Page 2466, Col. 2, line 43 – Col. 2, line 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the circular trajectory of Van Stevendaal et al., since the Examiner finds that the prior art reference (i.e., Van Stevendaal et al.) contains an apparatus which differed from the claimed apparatus by just the substitution of some technique with an other technique. The Examiner further finds the substitution of techniques (i.e., helical for circular) and their functions are known were known in the art, thus the Examiner finds that one of ordinary skill in the art would have recognized that substituting one known technique for another, and the result of the substitution would have been predictable.

Van Stevendaal et al. further teaches the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5); and

the second source trajectory is a helix (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5, transformation from x-y-$z_{constant}$ or equivalently α-β-$z_{constant}$ space to x-y-q or α-β-q space).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

With respect to claim 3, Harding as modified above suggests the device as recited above.

Harding further discloses the processor is configured to perform a filtered back-projection in the reconstruction volume (Col. 5, lines 4-10).

Harding fails to disclose along the curved lines.

Van Stevendaal et al. further teaches along the curved lines (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the curved lines of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

With respect to claim 4, Harding further discloses the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane (to include view angle and fan angle of scattering points); and

the detector is a two dimensional detector (Figure 1).

With respect to claim 7, Harding discloses a computer tomography (Title and Abstract) apparatus (Figure 1) for examination of an object of interest (Col. 2, lines 65-66, item 13), the computer tomography (CT) apparatus comprising:

a detector unit (16) with an x-ray source (S) and a scatter radiation detector (161);

the detector unit is rotatable (Figure 1) around a rotational axis (14) extending through an examination area (13) for receiving the object of interest;

the x-ray source generates a fan-shaped x-ray beam (41) adapted to penetrate the object of interest in the examination area in a slice plane (Figure 1);

the scatter radiation detector is arranged at the detector unit opposite to the x-ray source with an offset with respect to the slice plane in a direction parallel to the rotational axis (Col. 4, lines 1-4 and Figures 1 and 3);

the scatter radiation detector includes a plurality of first detector elements (161);

the plurality of first detector elements are energy-resolving detector elements (Col. 3, lines 38); and

a data processor (10) which is adapted to perform at least the following operation:

determining a wave-vector transfer by using the spectrum acquired by using the scatter radiation detector (Col. 2, lines 20-23 and Col. 4, lines 17-38); and

determining a reconstruction volume, a dimension of the reconstruction volume is determined by the wave-vector transfer (Col. 1, lines 24-29, Col. 1, lines 31-37 and Col. 4, lines 17-38 and Figures 1-3, momentum transfer determined for view and fan angle which is then reconstructed into voxels).

Harding fails to disclose the wave-vector transfer represents curved lines in the reconstruction volume.

Harding further fails to explicitly disclose rearranging the acquired CT data such that it corresponds to an acquisition where the x-ray source is displaced along a desired source trajectory in the reconstruction volume.

Van Stevendaal et al. teaches the wave-vector transfer represents curved lines in the reconstruction volume (Abstract, lines 4-6, Page 2468, Col. 2, lines 26-28 and Figures 3 and 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

Van Stevendaal et al. further teaches rearranging the acquired CT data such that it corresponds to an acquisition along a desired source trajectory in the reconstruction volume (Pages 2469-2470, Section 2. Parallel detector geometry).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the apparatus of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

With respect to claim 8, Harding further discloses the scatter radiation detector is a two-dimensional detector (Figure 1).

With respect to claim 9, Harding as modified above suggests the apparatus as recited above. Harding further discloses the scatter radiation detector is arranged at the detector unit

opposite to the x-ray source parallel to the slice plane and out of the slice plane with such an offset along the rotational axis such that the scatter radiation detector is arranged for receiving a scatter radiation scattered from the object of interest (Figures 1 and 3); and

the acquired CT data is acquired during an acquisition the x-ray source is displaced along a first source trajectory (Col. 3, lines 1-32);

Harding fails to explicitly disclose the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; and

the first source trajectory is a circle.

Harding further fails to disclose and the second source trajectory is a helix.

Van Stevendaal et al. teaches the first source trajectory is a circle (Page 2466, Col. 2, line 43 – Col. 2, line 3).

Van Stevendaal et al. teaches the first source trajectory is a circle (Page 2466, Col. 2, line 43 – Col. 2, line 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the apparatus of Harding as modified above the circular of Van Stevendaal et al., since the Examiner finds that the prior art reference (i.e., Van Stevendaal et al.) contains an apparatus which differed from the claimed apparatus by the substitution of some technique with an other technique. The Examiner further finds the substitution of techniques (i.e., helical for circular) and their functions are known were known in the art, thus the Examiner finds that one of ordinary skill in the art would have recognized that substituting one known technique for another, and the result of the substitution would have been predictable.

Van Stevendaal et al. further teaches the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5); and

the second source trajectory is a helix (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5, transformation from $x\text{-}y\text{-}z_{constant}$ or equivalently $\alpha\text{-}\beta\text{-}z_{constant}$ space to $x\text{-}y\text{-}q$ or $\alpha\text{-}\beta\text{-}q$ space).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the apparatus of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

With respect to claim 10, Harding as modified above suggests the apparatus as recited above.

Harding further discloses the acquired CT data is acquired during an acquisition a source of radiation is rotated around an object of interest in a rotation plane (Col. 3, lines 1-32);

the processor is furthermore adapted to perform a filtered back-projection in the reconstruction volume (Col. 5, lines 4-10); and

the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane (to include view angle and fan angle of scattering points).

Harding fails to explicitly disclose circular; and

along the curved lines.

Van Stevendaal et al. further teaches circular (Page 2465, Col. 1, lines 11-12 and Page 2466, Col. 1, line 43 – Col. 2, line 3 and Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Harding to include the circular of Van Stevendaal et al., since the Examiner finds that the prior art reference (i.e., Van Stevendaal et al.) contains an apparatus which differed from the claimed apparatus by the substitution of some technique with an other technique. The Examiner further finds the substitution of techniques (i.e., helical for circular) and their functions are known were known in the art, thus the Examiner finds that one of ordinary skill in the art would have recognized that substituting one known technique for another, and the result of the substitution would have been predictable.

Van Stevendaal et al. further teaches along the curved lines (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the apparatus of Harding as modified above the curved lines of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

With respect to claim 12, Harding discloses a method of performing a reconstruction of computed tomography (CT) data (Title and Abstract), the computed tomography data is

reconstructed from acquired CT data (Col. 3, lines 46-53) comprising at least a partial spectrum (Col. 1, lines 27-38, Col. 4, lines 17-24 and Col. 4, lines 30-38) acquired by using a detector (16) comprising energy resolving (Col. 4, lines 35-38) detector elements (161), the method comprising the acts of:

determining a wave-vector transfer by using the at least partial spectrum (Col. 2, lines 20-23 and Col.4, lines 17-38);

determining a reconstruction volume, a dimension of the reconstruction volume is determined by the wave-vector transfer (Col. 1, lines 24-29, Col. 1, lines 31-37 and Col. 4, lines 17-38 and Figures 1-3, momentum transfer determined for view and fan angle which is then reconstructed into voxels); and

rendering the reconstruction volume (Col. 5, lines 4-10).

Harding fails to disclose the wave-vector transfer represents curved lines in the reconstruction volume.

Harding further fails to explicitly disclose rearranging the acquired CT data such it corresponds to an acquisition along a desired source trajectory in the reconstruction volume.

Van Stevendaal et al. teaches the wave-vector transfer represents curved lines in the reconstruction volume (Abstract, lines 4-6, Page 2468, Col. 2, lines 26-28 and Figures 3 and 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

Van Stevendaal et al. further teaches disclose rearranging the acquired CT data such it corresponds to an acquisition along a desired source trajectory in the reconstruction volume (Pages 2469-2470, Section 2. Parallel detector geometry).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

With respect to claim 13, Harding as modified above suggests the method as recited above. Harding further discloses the acquired CT data is acquired during an acquisition a source of radiation is displaced along a first source trajectory (Col. 3, lines 1-32); and

the detector is a two dimensional detector (Figure 1).

Harding fails to explicitly disclose the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; and

the first source trajectory is a circle.

Harding further fails to disclose and the second source trajectory is a helix.

Van Stevendaal et al. teaches the first source trajectory is a circle (Page 2466, Col. 2, line 43 – Col. 2, line 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Harding as modified above the circular of Van Stevendaal et al., since the Examiner finds that the prior art reference (i.e., Van Stevendaal et al.) contains an apparatus which differed from the claimed apparatus by the substitution of some technique with an other technique. The Examiner further finds the substitution of techniques (i.e., helical for circular) and their functions are known were known in the art, thus the Examiner finds that one of ordinary skill in the art would have recognized that substituting one known technique for another, and the result of the substitution would have been predictable.

Van Stevendaal et al. further teaches the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5); and

the second source trajectory is a helix (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5, transformation from x-y-$z_{constant}$ or equivalently α-β-$z_{constant}$ space to x-y-q or α-β-q space).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harding in view of Van Stevendaal et al. as applied to claim 1 above, and further in view of Defrise et al. ("Improved 2D rebinning of helical cone-beam CT data using John's Equation", November 2002, 2002 IEEE Nuclear Science Symposium Conference Record, Volume 3, Pages 1463-1469).

With respect to claim 5, Harding as modified above suggests the device as recited above.

Harding fails to disclose the rearranging of the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume is performed by using John's Equation.

Van Stevendaal et al. further teaches the rearranging of the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume (Page 2469-2470, Section 2. Parallel detector geometry and Figures 3-5, transformation from x-y-$z_{constant}$ or equivalently α-β-$z_{constant}$ space to x-y-q or α-β-q space).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

Defrise et al. teaches the reconstruction volume is performed by using John's Equation (Title, Abstract and Page 1465, Col. 2, lines 17-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the using of Defrise et al., since a person would have been motivated to make such a modification to improve imaging by improving the accuracy of the rebinning algorithm (Page Abstract) as taught by Defrise et al.

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harding in view of Van Stevendaal et al. and Hsieh (6,529,575).

With respect to claim 15, Harding discloses a data processor for performing a reconstruction of computed tomography (CT) data (Title and Abstract), the computed tomography data is reconstructed from acquired CT data (Col. 3, lines 46-53) comprising at least a partial spectrum (Col. 1, lines 27-38, Col. 4, lines 17-24 and Col. 4, lines 30-38) acquired by using a detector (16) comprising energy resolving detector elements (161), the data processor to perform the following operation:

determining a wave-vector transfer by using the at least partial spectrum (Col. 2, lines 20-23 and Col.4, lines 17-38);

determining a reconstruction volume, a dimension of the reconstruction volume is determined by the wave-vector transfer (Col. 1, lines 24-29, Col. 1, lines 31-37 and Col. 4, lines 17-38 and Figures 1-3, momentum transfer determined for view and fan angle which is then reconstructed into voxels); and

rendering the reconstruction volume (Col. 5, lines 4-10).

Harding fails to disclose the wave-vector transfer represents curved lines in the reconstruction volume.

Harding further fails to rearranging the acquired CT data such that they correspond to an acquisition along a desired source trajectory in the reconstruction volume; and

a computer readable medium encoded with a computer program when implemented on the data processor, the program instructs the data processor to perform operations.

Van Stevendaal et al. teaches the wave-vector transfer represents curved lines in the reconstruction volume (Abstract, lines 4-6, Page 2468, Col. 2, lines 26-28 and Figures 3 and 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational time and by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

Van Stevendaal et al. further teaches disclose rearranging the acquired CT data such they correspond to an acquisition along a desired source trajectory in the reconstruction volume (Pages 2469-2470, Section 2. Parallel detector geometry).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Harding as modified above the rearranging of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve imaging by reducing computational complexity and thereby improve computational efficiency (Page 2471, Col. 2, lines 13-21 and Figures 5 and 10) as implied by Van Stevendaal et al.

Hsieh teaches a computer readable medium encoded with a computer program when implemented on the data processor, the program instructs the data processor to perform steps (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Harding as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to more easily update existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

Allowable Subject Matter

9. Claims 6, 11 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and amended to overcome the respective claim objections and claim rejection(s) under 35 U.S.C. 112, first paragraph and 35 U.S.C. 101 as set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter:

With respect to claims 6, 11 and 14, the prior art fails to teach or reasonably suggest a device, an apparatus and a method including rearranging of the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume is performed by using the following equation:

$$q = \tilde{q} + \frac{1}{2hc}\left[\frac{d_{\min} + d_{\max} - d}{d_{\min} * d_{\max}}\right]\alpha E \quad \text{with}$$

q being the wave-vector transfer,

$\tilde{q}$ being a virtual position of an x-ray source,

h being the Planck's constant,

c being the speed of light,

α denoting an angular position of the x-ray source in the rotational plane,

E being an energy of a corresponding x-ray photon,

d denoting a distance from a scatter center of the corresponding x-ray photon from the detector and

$d_{\min}$ and $d_{\max}$ being a beginning and an end of a region of interest of the curved lines in the reconstruction volume, when taken in combination with the other limitations of each respective claim.

Response to Arguments

10. Applicant's arguments with respect to at least claims 1, 7, 12 and 15 have been considered but are moot in view of the new ground(s) of rejection.

With respect to the objection to the specification, the Applicant argues that amendments to the specification are sufficient to overcome the objection of record. The Examiner disagrees. As noted in the specification objection above, the specification specifically refers to claim 6. The

Applicant's arguments, therefore, are not persuasive and the objection to the specification remains.

Applicant's arguments, see Page 19, lines 12-14, filed 12 June 2008, with respect to the drawing objection have been fully considered and are persuasive. The objection of the drawings has been withdrawn.

Applicant's arguments, see Page 20, lines 9-13, filed 12 June 2008, with respect to the objections to at least claims 1, 7, 12 and 15 have been fully considered and are persuasive. The objection to at least claims 1, 7, 12 and 15 has been withdrawn. However, as noted above, additional claim objections have been made to a least claims 1, 7, 12 and 15 as noted above.

Applicant's arguments, see Page 20, lines 17-19, filed 12 June 2008, with respect to the 35 USC § 101 rejection to at least claims 1 and 12 have been fully considered and are persuasive. The 35 USC § 101 rejection to at least claims 1 and 12 has been withdrawn.

With respect to claim 15, the Applicant argues amendments to the claim are sufficient to overcome the 35 USC § 101 rejection of record. The Examiner disagrees. As noted in 35 USC § 101 rejections of claim 15 above, the claim lacks a tangible result and is directed to nonstatutory functional descriptive material. The Applicant's arguments are not persuasive and the claim remains rejected.

Applicant's arguments, see Page 21, lines 16-18, filed 12 June 2008, with respect to the 35 USC § 112, second paragraph rejection to at least claim 1 have been fully considered and are persuasive. The 35 USC § 112, second paragraph rejection to at least claim 1 has been withdrawn.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Van Stevendaal et al. ("Filtered Back-Projection Reconstruction Technique for Coherent-Scatter Computed Tomography", 15 May 2003, Medical Imaging 2003: Image Processing, SPIE Volume 5032, pages 1810-1819) discloses the claimed apparatus and method (Entire document) and in particular equation 15 where data from circular acquisition trajectory restated in α-β-q space which equivalently represents acquisition of data in α-β-q from helical trajectory.

Schlomka et al. ("Coherent Scatter Computed Tomography – A Novel Medical Imaging Technique", 5 June 2003, Medical Imaging 2003: Physics of Medical Imaging, SPIE Volume 5030, pages 256-265) discloses the claimed apparatus (Entire document).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/Chih-Cheng Glen Kao/
Primary Examiner, Art Unit 2882